United States Department of Agriculture • Forest Service

Northeastern Forest Experiment Station

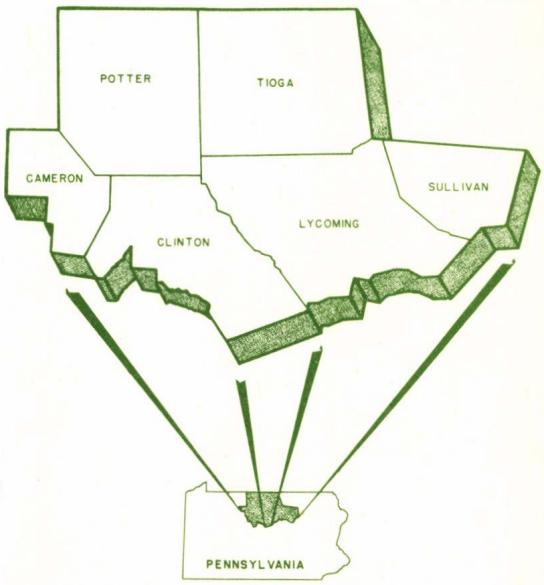
Upper Darby, Pennsylvania
Ralph W. Marquis, Director

Forest Statistics

for the

North-Central Section

of Pennsylvania



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FOREWORD

This is the fourth in a new series of reports about forest areas and timber volumes in Pennsylvania. It is a product of the Forest Survey of the Northeast, carried on by the Northeastern Forest Experiment Station as part of the nationwide survey being made by the Forest Service, U. S. Department of Agriculture.

The Pennsylvania State Planning Board provided the aerial photographs used in the survey. The Pennsylvania Department of Forests and Waters provided office space and gave other valuable assistance.

Field work in the North-Central Section of Pennsylvania was supervised by N. B. Griswold. The statistical procedures used were developed by C. Allen Bickford. Computations were made under the supervision of Roland H. Ferguson.

Ralph W. Marquis

RALPH W. MARQUIS
Director

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for the

North-Central Section

of Pennsylvania

Prepared By The

DIVISION OF FOREST ECONOMICS

Northeastern Forest Experiment Station
Forest Service, U.S. Dept. Agriculture

GENERAL

THE NORTH-CENTRAL SECTION is one of the most rugged and sparsely settled regions in Pennsylvania. In the southeastern part of this area there are very few roads, and most of them run along the rivers and tributaries. In about the center are some rugged and steep mountains and deep gorges. Here is the Pine Creek Gorge, about 50 miles long and at one point 1,000 feet deep, which is frequently called "Pennsylvania's Grand Canyon."

Two of the six counties in this area, Potter and Tioga, lie along the New York-Pennsylvania state line. To the west is the Allegheny National Forest, and to the east is the Anthracite Region. The other four counties in this section are Cameron, Clinton, Lycoming, and Sullivan. Lycoming County is the largest in the Commonwealth, even though all or part of seventeen counties have been organized from it. The largest city in this area is Williamsport, with a population of 45,000 people.

The population of these six counties in 1950 averaged

39 persons per square mile, one-sixth of that for the entire State. The range was from 14 persons per square mile in Sullivan County to 83 per square mile in Lycoming County. More than half of the population live in rural areas.

More than one-third of the small labor force of 54,000 men in this section are employed in manufacturing industries. Thirteen percent are employed in agriculture. Almost 3,000 men (5 percent of the total) are engaged in the manufacture of lumber and wood products.

Natural resources in the North-Central Section are mainly natural gas, coal, fire-clay, flagstone, timber, and agricultural land. Most of the gas wells are found in Cameron, Clinton, Potter and Tioga Counties. Bituminous coal is found in five of the six counties, and some anthracite is found in Sullivan County. Beds of fire clay are found in Cameron, Clinton, and Tioga Counties.

Timber is found in all six counties; it is most important in Lycoming, Potter, and Sullivan Counties. Only in Tioga County is there much agricultural land (about 40 percent), while in Cameron County a very small amount (4.5 percent) of the land is devoted to agriculture.

Forest Area

The total land area in the North-Central Section amounts to a little more than 3.3 million acres. Better than three-fourths of this--2,544,000 acres--is forest land. Only 4,500 acres of forest land are reserved from timber cutting. Most of this reserved forest land is in the World's End and Sizerville State Parks.

The most extensively forested county in this area and in the entire State is Cameron; 95 percent of its area is in commercial forest land. Clinton and Potter counties are more than 80 percent forested. Lycoming and Sullivan Counties are more than 70 percent forested. Only Tioga County is less than 60 percent forested (58 percent), but it contains one-sixth of the total forest land in this Section.

Ownership

The heaviest concentration of State-owned forest land is found in this Section (fig. 1). The Commonwealth owns more than a million acres in these six counties--42 percent of the total forest land. More than 925,000 acres are in State Forests and 144,000 acres in State Game Lands. Four counties own 15,200 acres, or 1 percent of the total forest land. Most of this acreage is owned by Clinton County.

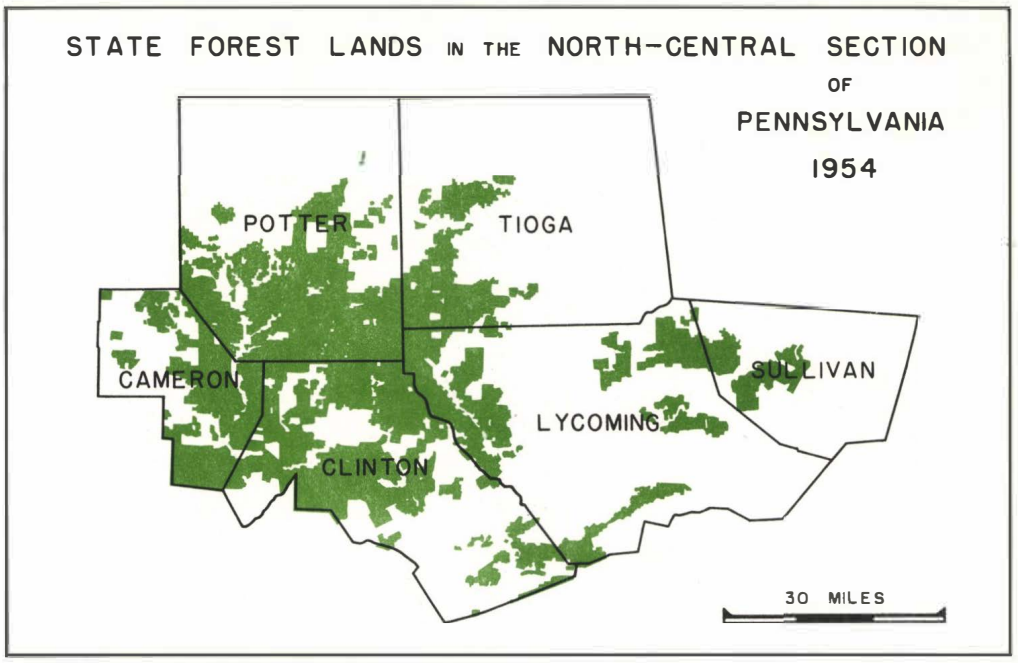

Figure 1.--The Commonwealth owns a large part of the forest land in the North-Central Section of Pennsylvania, including more than 925,000 acres in State Forests.

Federal and municipal holdings account for another 10,200 acres of publicly owned forest land.

Of the privately-owned forest land, farmers own about one-fourth, or 346,700 acres. Most of the remainder--1,029,700 acres--is held by numerous small private owners. About 68,200 acres of forest land in ownerships larger than 5,000 acres are held by six companies or individuals, the largest ownership being 28,000 acres.

Forest Types

Hardwood forest types occupy 95 percent of the commercial forest-land area. The sugar maple-beech-yellow birch forest type accounts for 43 percent of the total; it is mostly found in Potter, Tioga, and Sullivan Counties. The oak types (red oak, oak-hard pine, chestnut oak, and white oak) account for most of the remaining acreage; they are prodominant in Cameron, Clinton, and Lycoming Counties.

Other hardwood forest types--predominately aspen and oak-white pine--make up 12 percent of the total. The 5 percent of the forest-land area in softwood types is about

equally divided among the white pine hardwood, hard pine-oak, and hemlock forest types.

Forest Stands

Sawtimber stands occupy one-fourth of the commercial forest land. However, sawtimber stands of more than 5,000 board feet per acre occupy only 5 percent of the forest area. Still, they carry more than one-fourth of the total board-foot volume.

Almost two-thirds of the forest-land area is in pole-timber stands. Only 11 percent is in seedling-and-sapling stands and nonstocked areas.

Timber Volume

Growing stock in the North-Central Section amounts to 2¼ billion cubic feet. Of this, a little more than a third --826 million--is in sawtimber trees, and 1,451 million is in poletimber trees.

Included in this growing stock are almost 3-1/3 billion board feet (log scale, International ¼-inch rule) of sawtimber. Five species--red oak, black cherry, sugar maple, chestnut oak, and beech--make up two-thirds of the total hardwood board-foot volume, and each accounts for a quarter billion or more board feet. Other hardwood species together amount to 28 percent of the total board-foot volume. The softwood species, mostly white pine and hemlock, make up 15 percent of the total.

Pulpwood Volume

According to pulpwood specifications developed by the Northeastern and Appalachian Technical Committees of the American Pulpwood Association, practically all of the growing stock is suitable for use by the pulp industry--including some large sawlogs and veneer-log material. In terms of these specifications, there are almost 27 million rough standard cords of pulpwood bolts.

Hardwood species account for 93 percent of the total pulpwood volume. Almost a third of this is in the "soft" hardwood species--principally red maple, black cherry, aspen, and basswood. Softwood species--white pine, hemlock, and pitch pine--make up only 7 percent of the total.

Pulpwood stands averaging more than 5 cords per acre cover 77 percent of the commercial forest land. Of this, one-third carries more than 15 cords per acre. The remain-

ing 23 percent of the forest area is made up of land that has no pulpwood volume and other areas where pulpwood volume ranges to no more than 5 cords per acre.

NORTH-CENTRAL SECTION OF PENNSYLVANIA

Table 1.--Land area by major classes, 1953

Class of land[1]	Area	
	Acres	Percent
Forest land:		
Commercial	2,539,500	76
Noncommercial[2]	4,500	(3/)
All forest land	2,544,000	76
Nonforest land	808,300	24
All land[4]	3,352,300	100

[1] See Appendix for definitions.

[2] Includes 4,130 acres in State Parks reserved from timber cutting.

[3] Less than 1 percent.

[4] Census of Agriculture, 1950. Water areas of 1 to 40 acres are included in the estimate of nonforest acreage.

Table 2.--Land area and commercial forest-land area by county, 1953

County	Land area	Commercial forest-land area	
	Acres	Acres	Percent
Cameron	256,600	243,600	95
Clinton	577,300	509,000	88
Lycoming	777,600	561,400	72
Potter	698,900	559,100	80
Sullivan	305,900	239,300	78
Tioga	736,000	427,100	58
All	3,352,300	2,539,500	76

Table 3.--Commercial forest-land area by ownership, 1953

Ownership class	Acreage held	
	Acres	Percent
Private:		
Farm forest land[1]	346,700	14
Other private	1,097,900	43
Total private	1,444,600	57
Public:[2]		
State	1,069,500	42
County	15,200	1
Federal[3]	6,800	(4/)
Municipal	3,400	(4/)
Total public	1,094,900	43
All ownerships	2,539,500	100

[1]Census of Agriculture, 1950.

[2]Includes 925,200 acres of State Forest Lands and 144,000 acres of State Game Lands.

[3]Entire area administered by U.S. Army.

[4]Less than 1 percent.

Table 4.--State-owned forest-land area by county and type, 1953

County	State Forests	Game lands	Parks and picnic areas[1]	Total[2]
	Acres	Acres	Acres	Acres
Cameron	119,866	12,730	1,310	133,906
Clinton	239,819	10,541	100	250,460
Lycoming	154,037	36,977	6	191,020
Potter	259,074	17,562	193	276,829
Sullivan	36,541	46,892	2,046	85,479
Tioga	115,835	19,321	660	135,816
Total	925,172	144,023	4,315	1,073,510

[1]All the acreage is reserved from timber cutting.

[2]Does not include 419 acres for state institutions.

NORTH-CENTRAL SECTION OF PENNSYLVANIA

Table 5.--Commercial forest-land area by forest type, 1953

Forest type	Area	
	Acres	Percent
Sugar maple-beech-yellow birch	1,125,100	43
Red oak	554,800	22
Chestnut oak	339,700	13
Aspen	253,000	10
White oak	115,800	5
Other hardwood types[1]	41,200	2
White pine-hardwood	38,700	2
Other softwood types[2]	71,200	3
All types	2,539,500	100

[1]Includes 20,000 acres of oak-hard pine type.

[2]Includes 31,600 acres of hard pine-oak type and 29,900 acres of hemlock type.

Table 6.--Commercial forest-land area by forest-type group and stand-size class, 1953

Forest-type group	Saw-timber stands	Pole-timber stands	Seedling-and-sapling stands and other areas	Total area
	Acres	Acres	Acres	Acres
Sugar maple-beech-yellow birch	297,700	731,200	96,200	1,125,100
Red oak	165,000	332,100	57,700	554,800
Chestnut oak	63,600	241,300	34,800	339,700
Other hardwood types	45,300	270,600	94,100	410,000
Softwood types	57,100	52,800	(1/)	109,900
All types	628,700	1,628,000	282,800	2,539,500
Percent	25	64	11	100

[1]No plots in the softwood types fell in this stand-size class.

Table 7.--Commercial forest-land area by stand-size class and drainage area, 1953

Stand-size class	Drainage area		Total
	Allegheny River	Susquehanna River	
	Acres	Acres	Acres
Sawtimber stands:			
More than 5,000 board feet per acre	9,900	120,600	130,500
1,500 to 5,000 board feet per acre	36,800	461,400	498,200
Poletimber stands:			
More than 600 cubic feet per acre	29,800	937,500	967,300
200 to 600 cubic feet per acre	45,400	615,300	660,700
Other areas[1]	10,600	272,200	282,800
Total	132,500	2,407,000	2,539,500
Percent	5	95	100

[1]Includes 256,500 acres in seedling-and-sapling stands.

Table 8.--Net volume of live timber on commercial forest land by species, 1953

Species	Growing stock[1]	Sawtimber[2]	Suitable for pulpwood[3]
	Thousand cu.ft.	Thousand bd.ft.	Thousand cords
White pine	79,800	230,100	879
Hemlock	72,500	196,900	798
Pitch pine	20,200	59,000	222
Other softwoods	1,000	3,200	11
All softwoods	173,500	489,200	1,910
Sugar maple	280,500	321,400	3,296
Northern red oak	274,400	488,900	3,224
Other red oaks	50,300	89,300	591
Red maple	252,700	163,700	2,969
Chestnut oak	228,300	310,700	2,683
Black cherry	207,400	478,300	2,437
Beech	142,800	249,500	1,678
Aspen	133,100	42,800	1,564
Sweet birch	114,100	53,700	1,341
Basswood	107,600	209,200	1,264
White oak	106,600	169,400	1,253
White ash	99,900	98,300	1,174
Yellow birch	49,900	23,400	586
Other soft hardwoods	33,700	56,800	396
Other hard hardwoods	22,000	24,100	258
All hardwoods	2,103,300	2,779,500	24,714
All species	2,276,800	3,268,700	26,624

[1]See Appendix for definitions. Growing stock includes pulpwood and sawtimber.

[2]Log scale, International ¼-inch rule.

[3]4-foot bolts, including bark.

Table 9.--Net volume of live timber on commercial forest land by diameter class, 1953

Diameter class[1] (in inches at breast height)	Growing stock	Saw-timber
	Thousand cu.ft.	Thousand bd.ft.
Softwoods:		
6	24,900	--
8	18,400	--
10	30,000	97,200
12	27,200	96,400
14	19,000	73,800
16	19,600	77,200
18 +	34,400	144,600
All softwoods	173,500	489,200
Hardwoods:		
6	478,700	--
8	507,000	--
10	421,600	--
12	260,200	915,100
14	193,900	783,200
16	91,500	392,700
18	73,500	312,000
20	31,700	145,200
22 +	45,200	231,300
All hardwoods	2,103,300	2,779,500
Total	2,276,800	3,268,700

[1]The midpoint of each 2-inch diameter class is indicated.

Table 10.--Net volume of live timber on commercial forest land by forest type, 1952

Forest type	Growing stock	Saw-timber	Suitable for pulpwood
	Thousand cu.ft.	Thousand bd.ft.	Thousand cords
Sugar maple-beech-yellow birch	1,220,000	1,693,000	14,266
Red oak	474,100	706,300	5,544
Chestnut oak	224,800	307,800	2,629
Aspen	142,800	106,400	1,670
Other hardwood types	108,700	212,300	1,271
Softwood types	106,400	242,900	1,244
All types	2,276,800	3,268,700	26,624

Table 11.--Average net volume of live timber per acre of commercial forest land, by stand-size class, 1953

Stand-size class (and acreage of each class)	Growing stock	Sawtimber
	Cubic feet	Board feet
Sawtimber stands:		
More than 5,000 bd.ft. per acre (130,500 acres)	2,100	6,700
1,500 to 5,000 bd.ft. per acre (498,200 acres)	1,400	3,000
Poletimber stands:		
More than 600 cu.ft. per acre (967,300 acres)	1,000	700
200 to 600 cu.ft. per acre (660,700 acres)	400	200
Other[1] (282,800 acres)	100	100
Average, all classes[2] (2,539,500 acres)	900	1,300

[1]Includes seedling-and-sapling stands and nonstocked areas.

[2]Hardwoods constitute 92 percent of the total growing stock or 85 percent of the total sawtimber volume. The average cubic volume of the total commercial forest area is equivalent to 11 cords per acre.

Table 12.--Area and volume by pulpwood volume-per-acre class, 1953

Pulpwood class	Area	Volume
	Thousand acres	Thousand cords
Less than 5 cords per acre	577	1,228
5 to 15 cords per acre	1,296	11,917
More than 15 cords per acre	667	13,479
Total	2,540	26,624

APPENDIX

DEFINITIONS OF TERMS

Forest Area

Forest-land area.--Includes (a) lands that are at least 10 percent stocked by trees of any size and capable of producing timber or other wood products, or of exerting influence on the climate or on the water regime; (b) land from which the trees described in (a) have been removed to less than 10 percent stocking and which has not been developed for other use; and (c) afforested areas. (Forest tracts of less than 1 acre, isolated strips of timber less than 120 feet wide, and abandoned fields and pastures not yet 10 percent stocked are excluded.)

Commercial forest-land area.--Forest land that is (a) producing, or physically capable of producing, usable crops of wood (usually sawtimber), (b) economically available now or prospectively, and (c) not withdrawn from timber utilization.

Noncommercial forest-land area.--Forest land (a) withdrawn from timber utilization through statute, ordinance, or administrative order but which otherwise qualifies as commercial forest land, and (b) incapable of yielding usable wood products (usually sawtimber) because of adverse site conditions.

Forest Types

Forest types are classified according to the species or species group that accounts for the major portion of the stand in terms of cubic feet in sawtimber and poletimber stands, or the number of stems in seedling-and-sapling stands.

Stand-Size Classes

Sawtimber stands.--Stands with sawtimber trees having a minimum net volume per acre of 1,500 board feet, International $\frac{1}{4}$-inch rule.

Poletimber stands.--Stands failing to meet the sawtimber stand specification, but at least 10 percent stocked

with poletimber and larger (5.0 inches and larger) trees, and with at least half the minimum stocking in poletimber trees. (Poletimber stands carry at least 200 cubic feet per acre.)

Seedling-and-sapling stands.--Stands not qualifying as either sawtimber or poletimber stands, but having at least 10 percent stocking of trees of commercial species and with at least half the minimum stocking in seedling-and-sapling trees.

Other areas.--Forest-land areas not qualifying as sawtimber, poletimber, or seedling-and-sapling stands. (Includes nonstocked areas.)

Tree Classes

Sawtimber trees.--Trees of commercial species that contain at least one merchantable sawlog as defined by regional practice and that are of the following minimum diameters at breast height (d.b.h.): Softwoods 9.0 inches and hardwoods 11.0 inches. (All butt sawlogs are considered merchantable. Where the butt is defective, upper sawlogs are considered merchantable if they account--in terms of aggregate net volume--for 50 percent or more of the gross volume below the top of the uppermost sawlog. Softwood sawlogs are at least 6.0 inches in diameter inside bark at small end; 8 to 16 feet in length; sound and straight enough to be manufactured into standard lumber. The smaller logs are generally free of surface defects other than small tight knots. Hardwood sawlogs are at least 8.0 inches in diameter inside bark at small end; 8 to 16 feet in length; suitable for sawing into standard lumber, construction timbers, or ties.)

Poletimber trees.--Trees 5.0 inches d.b.h. and larger of commercial species that do not meet the specifications for sawtimber trees but do meet regional specifications of species, soundness, and freedom from defect. (These are the trees that are straight and clear enough to make sawtimber trees eventually.)

Seedling-and-sapling trees.--Trees of commercial species less than 5.0 inches in diameter at breast height.

Cull trees.--Live trees of sawtimber or poletimber size that are unmerchantable for sawlogs now or prospectively because of defect, rot, or species.

Timber Volume

Growing stock.--Net volume, in cubic feet, of live sawtimber trees and live poletimber trees from stump to a minimum 4.0-inch top (of central stem) inside bark.

Live sawtimber volume.--Net volume in board feet, International ¼-inch rule, of live sawtimber trees.

Pulpwood.--Net volume in rough, standard cords (bark included) of growing stock, excluding sound defect as well as unsound defect.

Pulpwood Volume

The pulpwood specifications used in this report are those set up by the Northeastern and Appalachian Technical Committees of the American Pulpwood Association.

Pulpwood trees.--Live trees of commercial species, 5.0 inches d.b.h. and larger, containing at least two contiguous pulpwood bolts and with 50 percent or more of the main stem volume usable for pulp. (A merchantable pulpwood bolt is a section of the main stem of a pulpwood tree, 4 feet long; 4.0 inches or larger inside bark at the small end; free from any indication of rot, charred wood, metal or hollow center; and contiguous to one or more sections meeting these same requirements. Crotches are excluded; sweep or crook in any section shall exclude the bolt if a line from the center of the top cut to the center of the bottom cut passes outside the wood at any point. Most of the sawtimber and poletimber trees are also defined as pulpwood trees.)

Pulpwood volume.--Net volume in standard cords (including bark), of the main stem of pulpwood trees, from the stump to a point where the top breaks up into branches, or to a minimum top diameter of 4.0 inches (inside bark). Deductions are made for all portions of the stem that fail to meet pulpwood bolt requirements.

Pulpwood Stands

Less than 5 cords per acre: Stands with trees 5.0 inches (d.b.h.) and larger that meet pulpwood specifications, and with a net volume per acre of less than 400 cubic feet. (Includes seedling-and-sapling stands and nonstocked areas.)

5 to 15 cords per acre: Stands with trees 5.0 inches (d.b.h.) and larger that meet pulpwood specifications, and with a net volume per acre ranging from 400 to 1,200 cubic feet.

More than 15 cords per acre: Stands with trees 5.0 inches (d.b.h.) and larger that meet pulpwood specifications, and with a net volume per acre of more than 1,200 cubic feet.

FOREST SURVEY METHODS

These forest statistics are based on information gathered from aerial photographs and from sample plots examined on the ground.

First, photo-interpretation plots were marked off on the aerial photographs. These plots were distributed uniformly by mechanical means over photographs of the entire district. Trained photo-interpreters then classified each photo-plot as either forest or nonforest. Forest plots were classified further according to stand-size and forest type.

Field crews inspected some of the photo-plots on the ground. Enough plots were selected at random so as to attain a specified level of statistical accuracy. Species and volume data were collected on these ground plots; and the photo classification of stand size and forest type was verified or--if necessary--changed.

The survey was designed for maximum efficiency in estimating total cubic volume to meet the national standards of accuracy.

ACCURACY OF THE ESTIMATES

The estimates in this report may contain two kinds of error. First, photo-interpreters may make mistakes of judgment and fieldmen may make mistakes in measuring or recording. There is no practical way of finding out just how often such errors occur. But they are kept to a minimum by closely checking all phases of the work.

The second kind of error is associated with sampling procedures. The size of this sampling error can be measured. In the North-Central Section of Pennsylvania the probabilities are 2 out of 3 that the actual forest area is within ± 1.0 percent of the estimated forest area, that the actual cubic-foot volume is within ± 4.3 percent of the estimated cubic-foot volume, and that the actual board-foot volume is within ± 8.8 percent of the estimated board-foot volume. This does not include any mistakes in measurement or classification.

These percentages show that the area estimates are more accurate than the volume estimates, and that the cubic-

foot estimates are more accurate than the board-foot estimates.

In each of the tables, the total figures are more accurate than the subtotals. The subtotals are more accurate than any of the individual figures. Figures that are small in relation to totals are subject to larger sampling errors.

SPECIES TALLIED

The various commercial tree species tallied in the North-Central Section of Pennsylvania are listed below. Approved common names[1] are shown in parentheses if they differ from the brief name used in the tables. Other tree species may occur in the area, but unless they were tallied on the field plots they were not included in the following list.

Softwoods

White pine (Eastern white pine)	- Pinus strobus
Hemlock (Eastern hemlock)	- Tsuga canadensis
Pitch pine	- Pinus rigida
Other softwoods	
(White spruce)	- Picea glauca
(Northern white-cedar)	- Thuja occidentalis

Soft Hardwoods

Red maple	- Acer rubrum
Black cherry	- Prunus serotina
Quaking aspen	- Populus tremuloides
Basswood (American basswood)	- Tilia americana
Other soft hardwoods	
(Yellow-poplar)	- Liriodendron tulipifera
(Paper birch)	- Betula papyrifera
(Elm)	- Ulmus species
(Butternut)	- Juglans cinerea
(Sweetgum)	- Liquidambar styraciflua
(Cucumbertree)	- Magnolia acuminata

Hard Hardwoods

Sugar maple	- Acer saccharum
Northern red oak	- Quercus rubra

[1]Little, Elbert L., Jr. Check list of native and naturalized trees of the United States (including Alaska). U.S. Dept. Agr., Agr. Handb. 41. 472 pp. 1953.

Other red oaks	
(Black oak)	- *Quercus velutina*
(Scarlet oak)	- *Quercus coccinea*
(Pin oak)	- *Quercus palustris*
Chestnut oak	- *Quercus prinus*
Beech (American beech)	- *Fagus grandifolia*
Sweet birch	- *Betula lenta*
White oak	- *Quercus alba*
White ash	- *Fraxinus americana*
Yellow birch	- *Betula alleghaniensis*
Other hard hardwoods	
(Hickory)	- *Carya* species
(Black locust)	- *Robinia pseudoacacia*
